

Poor Clinical Outcomes Among Pneumonia Patients With Schizophrenia

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Despite the recent attention to patient safety and quality of care, no prior studies have addressed outcomes of hospitalization for pneumonia among patients with schizophrenia. This study investigated the extent to which clinical outcomes of pneumonia were different among patients with schizophrenia. This study used data from the Taiwan National Health Insurance Research Database. Of the total of 81 599 patients admitted with a principal diagnosis of pneumonia from 2002 to 2004, 949 had previously been admitted with a principal or secondary diagnosis of schizophrenia within the 2 years of their index pneumonia admission. We randomly selected 2847 pneumonia patients matched with the study group in terms of gender, age, year of admission, length of stay, and Charlson Comorbidity Index score as the comparison cohort. Conditional logistic regression models were used for analysis. Findings indicated a higher prevalence of adverse outcomes among patients with schizophrenia. Patients with schizophrenia were independently associated with a 1.81 times greater risk of intensive care unit admission (95% confidence interval [CI] = 1.37–2.40), a 1.37 times greater risk of acute respiratory failure (95% CI = 1.08–1.88), and a 1.34-fold greater risk of mechanical ventilation (95% CI = 1.04–1.92) after adjusting for characteristics of patients, physicians, hospitals, and potential clustering effects. Adjusted odds ratios were further evident among those treated in private hospitals and in regional/district hospitals. Significant barriers to prompt and appropriate medical care for pneumonia persist for patients with schizophrenia. Careful monitoring of physical health and proper integration between psychiatrists and physicians should be stressed to reduce poor clinical outcomes in this vulnerable population.

Key words: schizophrenia/pneumonia/clinical outcomes

Introduction

Pneumonia is one of the most prevalent infectious diseases worldwide and is associated with considerable morbidity, mortality, and use of healthcare resources.¹ In the United States, it accounts for more than 1 million hospitalizations annually, with estimated costs of 12.2 billion.² In Taiwan, where it is the most frequent cause of death from infectious disease, about 0.16 million are hospitalized annually for treatment of pneumonia.³ Optimal management of pneumonia requires early diagnosis and treatment.

Schizophrenia is the most chronic and disabling disease of all major mental illnesses.⁴ Patients with schizophrenia suffer excess mortality attributed to natural causes compared with the general population.^{5,6} They also experience increased higher risk of several physical illnesses,^{7,8} less access to physical healthcare resources,^{9,10} and lower quality of medical care¹¹ compared with the general or nonpsychiatric population. A recent study carried out in the United States reported at least twice the odds of adverse events (ie, infections due to medical care and postoperative respiratory failure and sepsis) for patients with schizophrenia during medical and surgical hospitalizations compared with patients without schizophrenia.¹¹ Poor clinical and economic outcomes were also observed. In examining the clinical course for patients who underwent appendectomy, Cooke et al¹² reported a pattern of late diagnosis, adverse patient behaviors, and higher complication and death rates among patients with schizophrenia.

Despite the recent attention to patient safety and quality of care, no prior studies have specifically addressed the outcomes of hospitalization due to pneumonia among patients with schizophrenia. Previous literature reported that poor treatment outcomes among patients with schizophrenia were associated with their increased risk of medical injuries and their specific behaviors and perceptions.^{11–13} It remains unclear how treatment outcomes for hospitalization due to pneumonia could be improved in this vulnerable population.

This nationwide, population-based study aimed to investigate the extent to which clinical outcomes (ie, intensive care unit [ICU] admission, use of mechanical ventilation, acute respiratory failure, and in-hospital death) of pneumonia differ among patients with schizophrenia compared with pneumonia patients without schizophrenia. These outcomes were addressed because patients with pneumonia may present respiratory failure and require ICU admission.^{14,15} The final clinical outcome was mortality, with the use of mechanical ventilation as one significant independent risk factor for fatality.^{16–18} We hypothesized that schizophrenia was associated with greater risk of adverse clinical outcomes.

Methods

Database

This study used the National Health Insurance Research Database (NHIRD) provided by Taiwan's National Health Research Institute to scientists in Taiwan for research purposes. Taiwan initiated a single-payer National Health Insurance (NHI) program in 1995. Over 98% of Taiwan's 22.96 million population were enrolled in this program in 2007. The NHIRD consists of original claims data for reimbursement as well as a registry of all enrollees and allows researchers to trace all medical services received by enrollees under the NHI program since 1995. Specifically, inpatient claims, details of inpatient orders, a complete registry of contracted medical care institutions, and a complete registry of board-certified specialists for every inpatient admission of a NHI beneficiary were available in the NHIRD. All these records can be linked accurately with internal identification numbers created by NHIRD. The NHIRD is therefore one of the largest and most comprehensive data sets currently available in the world, and it provides a unique opportunity to compare clinical treatment outcomes for pneumonia patients with and without schizophrenia.

Because the data set used for this study consists of de-identified secondary data released to the public for research purposes, this study was exempt from full review by the Internal Review Board.

Study Sample

We identified 479 715 patient admissions with a principal diagnosis of pneumonia (ICD-9-CM 480–483.8, 485–487.0) from January 2002 to December 2004. If a patient had more than 1 admission for the treatment of pneumonia during the study period, we selected only the first one for inclusion in the study sample ($n = 373\,442$). We excluded patients under 18 years of age ($n = 184\,309$) in order to limit the study to the adult population. In addition, we excluded the elderly population (patients over 65 y) ($n = 107\,534$) because the elderly are more likely to have multiple complications or comorbidities, which

might confound pneumonia treatment outcomes. Of 81 599 pneumonia patients, 1082 had been admitted with a principal or secondary diagnosis of schizophrenia (any ICD-9-CM 295 code other than 295.7-schizoaffective disorder) within 2 years prior to their index pneumonia admission (during the period 2000–2004). In Taiwan, if a patient who has any history of schizophrenia diagnosis is hospitalized, regardless of the causes for this hospitalization, his or her medical claim would definitely show the schizophrenia diagnosis (either as principal or secondary diagnosis) because schizophrenia is classified as one of the major catastrophic illnesses under NHI. Patients with serious mental disorders can be issued a catastrophic illness card once their diagnoses have been verified. Because the co-payment for outpatient or inpatient psychiatric care is waived for holders of catastrophic illness cards, it is in the patients' interest that the diagnosis of schizophrenia would appear in the medical claims. Furthermore, we excluded those who had co-occurring substance use disorders or any psychiatric disorder (ICD-9-CM codes 290–319) other than schizophrenia ($n = 133$) during 2000–2004. As a result, 949 patients with schizophrenia were included in our study group.

The comparison group was extracted from the remaining 80 606 pneumonia patients. Similarly, patients who had substance use disorders or any psychiatric disorder were excluded from both the schizophrenia and comparison groups to promote homogeneity and comparability between groups. Thereafter, we randomly selected 2847 patients (3 for every patient with schizophrenia) matched with the study group in terms of gender, age (<24, 25–34, 35–44, 45–54, and 55–64 y), year of admission, length of stay (LOS) (≤ 4 , 5–6, 7–10, and ≥ 10), and Charlson Comorbidity Index score (CCI) (0, 1, 2, and ≥ 3). The cut-off points for LOS were determined by the volume, which most closely divided the sample patients into 4 groups that were roughly equal in size. The CCI was designed to quantify preexisting comorbidities as a means of adjusting for the higher mortality risks associated with 19 medical conditions (congestive heart failure, myocardial infarction, liver disease, cancer, dementia, etc.). Ultimately, 3796 pneumonia patients were included in our sample.

Key Variables of Interest

All the variables used for investigation were retrieved from inpatient claims. The primary study outcome consisted of binary variables, including clinical outcomes of “ICU admission,” “use of mechanical ventilation,” “acute respiratory failure,” and “in-hospital death.” We define in-hospital death as “the death of a patient at any time after admission if the patient does not leave the hospital.” The independent variable of interest was whether or not a pneumonia patient had been admitted for treatment of schizophrenia within 2 years of their index pneumonia admission.

In this study, we also take potential confounders including the characteristics of physician and hospital into consideration in the regression modeling. Physician characteristics included physician's gender, age, and specialty (pulmonary or critical care medicine vs other specialties). Hospital characteristics included hospital accreditation level, ownership status (public, private not-for-profit, and private for-profit), and geographical location (Northern, Central, Southern, or Eastern Taiwan). Each hospital in Taiwan can be categorized as a medical center (with a minimum of 500 beds), a regional hospital (minimum 250 beds), or a district hospital (minimum 20 beds). Hospital level can be used as a proxy for both hospital size and technological capabilities in clinical services.

Statistical Analysis

We used the SAS statistical package (SAS System for Windows, Version 8.2) to perform all analyses in this study. Pearson χ^2 tests were used to examine differences between pneumonia patients with and without schizophrenia in terms of characteristics of patient, physician, and hospital. Separate conditional logistic regressions (stratified by patient gender, age, year of admission, LOS, CCI, physician, and hospital) were carried out for each clinical outcome. A 2-sided *P* value of $<.05$ was considered statistically significant for this study.

Results

Overall, the mean age for the sampled patients was 44.4 years with a standard deviation of 12.0 years. Mean LOS and hospitalization costs were 7.8 days (± 7.9 d) and \$NT35 634 (\pm \$NT69 348; US \$1 = NT \$33 in 2004), respectively. Table 1 presents the distributions of characteristics of patient, physician, and hospital for the study and comparison groups. It shows that after matching for age, gender, year of admission, CCI, and LOS, the proportions of schizophrenia and comparison patients at different hospital levels, ownership and location (all $P < .001$), and physician gender ($P = .007$) and specialty ($P = .013$) differed significantly.

Table 2 shows the distribution of adverse clinical outcomes among pneumonia patients with and without schizophrenia. Patients with schizophrenia had significantly higher likelihood of ICU admission (14.3% vs 8.7%, $P < .001$) and acute respiratory failure (9.2% vs 6.6%, $P = .007$) than patients without schizophrenia. These 2 groups, however, did not differ significantly in the outcomes of use of mechanical ventilation and in-hospital death. Table 2 also shows that patients with schizophrenia were 1.76 times as likely to be admitted to the ICU (95% confidence interval [CI] = 1.41–2.20, $P < .001$) and 1.44 times as likely to have acute respiratory failure (95% CI = 1.10–1.87, $P = .008$) as patients without schizophrenia.

Table 1. Demographic Characteristics of Pneumonia Patients With and Without Schizophrenia in Taiwan in the Year 2002–2004 ($n = 3796$)

	Patients with Schizophrenia (<i>n</i> = 949)		Comparison Cohort (<i>n</i> = 2847)		
Variable	Total No.	%	Total No.	%	<i>P</i> Value
Patient characteristics					
Gender					1.000
Male	639	67.3	1917	67.3	
Female	310	32.7	910	32.7	
Age					1.000
18–24	61	6.4	183	6.4	
25–34	141	14.9	423	14.9	
35–44	252	26.5	756	26.5	
45–54	288	30.4	864	30.4	
55–64	207	21.8	621	21.8	
Charlson Comorbidity Index score					1.000
0	713	75.1	2139	75.1	
1	175	18.4	525	18.4	
2	33	3.5	99	3.5	
≥3	28	3.0	84	3.0	
Length of stay (d)					1.000
≤4	255	26.9	765	26.9	
5–6	205	21.6	615	21.6	
7–10	250	26.3	750	26.3	
≥11	239	25.2	717	25.2	
Hospital characteristics					
Hospital level					<.001
Medical center	144	15.2	628	22.1	
Regional hospital	389	41.0	1165	40.9	
District hospital	416	43.8	1054	37.0	
Hospital ownership					<.001
Public	461	48.6	801	28.1	
Private (not-for-profit)	249	26.2	1098	38.6	
Private (for-profit)	239	25.2	948	33.3	
Hospital Location					<.001
Northern	268	28.2	1090	38.3	
Central	211	22.2	730	25.6	
Southern	290	30.6	937	32.9	
Eastern	180	19.0	90	3.2	
Physician characteristics					
Gender					.007
Male	870	91.7	2681	94.2	
Female	79	8.3	166	5.8	
Age					.608
<40	421	44.4	1214	42.6	
40–49	370	34.0	1158	40.7	
>49	158	16.6	475	16.7	
Physician specialty					.013
Pulmonary or critical care medicine	386	40.7	1289	45.3	
Other	563	59.3	1558	54.7	

Table 2 also shows the adjusted odds ratio (OR) of ICU admission, acute respiratory failure, the use of mechanical ventilation, and in-hospital death. Conditional

Table 2. Crude Odds Ratio (OR) for Adverse Clinical Outcomes for Pneumonia Patients With or Without Schizophrenia in Taiwan

Presence of Adverse Clinical Outcome	Total Sample, <i>n</i> = 3796		Schizophrenia, <i>n</i> = 949		Comparison Group, <i>n</i> = 2847	
	No.	%	No.	%	No.	%
Intensive care unit admission						
Yes	383	10.1	136	14.3	247	8.7
Crude OR (95% CI)	—		1.76*** (1.41–2.20)		1.00	
Adjusted OR (95% CI)	—		1.81*** (1.37–2.40)		1.00	
Acute respiratory failure						
Yes	274	7.2	87	9.2	187	6.6
Crude OR (95% CI)	—		1.44** (1.10–1.87)		1.00	
Adjusted OR (95% CI)	—		1.37* (1.08–1.88)		1.00	
Mechanical ventilation						
Yes	209	5.5	60	6.3	149	5.2
Crude OR (95% CI)	—		1.22 (0.90–1.67)		1.00	
Adjusted OR (95% CI)	—		1.34* (1.04–1.92)		1.00	
In-hospital death						
Yes	75	2.0	20	2.1	55	1.9
Crude OR (95% CI)	—		1.09 (0.65–1.83)		1.00	
Adjusted OR (95% CI)	—		1.60 (0.88–2.90)		1.00	

Note: CI, confidence interval. Adjusted ORs were calculated by conditional logistic regressions (stratified by patient gender, age, year of admission, length of stay, Charlson Comorbidity Index score, physician, and hospital) to adjust for physician's age, gender and specialty, and hospital accreditation level, ownership and geographic location, and clustering effects of physician and hospital.

* $P < .05$; ** $P < .01$; *** $P < .001$.

logistic regression analyses (stratified by patient gender, age, year of admission, LOS, CCI, physician, and hospital) revealed that after adjusting for physician age, gender, and specialty, and hospital accreditation level, ownership and geographic location, and clustering effects among patients treated by any given physician or hospital, patients with schizophrenia were 1.81 (95% CI = 1.37–2.40, $P < .001$), 1.37 (95% CI = 1.08–1.88, $P = .013$), and 1.34 (95% CI = 1.04–1.92, $P = .023$) times more likely to be admitted to the ICU to have acute respiratory failure and the use of mechanical ventilation, respectively, than patients without schizophrenia.

Table 3 further analyzed the ORs of ICU admission, acute respiratory failure, the use of mechanical ventilation, and in-hospital death between patients with and without schizophrenia according to the characteristics of hospital and physician. In general, adjusted ORs for pneumonia patients with schizophrenia compared with those without schizophrenia were further increased among those treated in private hospitals and regional/district hospitals and by younger physicians (less than 49 y old). There were no higher odds of in-hospital death for either of these 2 groups across all characteristics of physician and hospital.

Discussion

This is the first report in the medical literature to assess treatment outcomes among patients with schizophrenia during pneumonia hospitalization. Compared with patients without schizophrenia, patients with schizophrenia experienced a 1.3- to 1.8-fold increased risk of adverse clinical outcomes,

including ICU admission, acute respiratory failure, and mechanical ventilation. However, the risk could be lessened if patients were treated in medical centers.

While a diagnosis of schizophrenia was associated with higher prevalence of several physical diseases (eg, diabetes, hypertension, asthma, and acute respiratory disorders),⁷ adverse treatment outcomes from physical diseases among patients with schizophrenia have been reported. For example, Cooke et al¹² reported that the complication and death rates were high for patients with schizophrenia suffering from appendicitis who underwent appendectomy. In comparing the occurrence of postoperative complications after coronary artery bypass surgery, Li et al¹⁹ found patients with mental disorders were more prone to potentially preventable complications and injuries than those without mental illness.

Our study further investigated a specific vulnerable category of patients: patients with schizophrenia who are hospitalized for pneumonia. Because psychotropic medications may elevate risk of respiratory and pulmonary irregularities,²⁰ pneumonia merits attention in this susceptible population. Our study identified adverse clinical outcomes in treating pneumonia among patients with schizophrenia. However, it is worth noting that in-hospital mortality did not increase significantly among patients with schizophrenia. This finding implies a lack of prompt detection and proper prevention, which intensifies the risk of poor hospitalization outcomes among patients with schizophrenia, as opposed to earlier diagnosis. In further analysis according to the characteristics of hospitals, the risk of adverse clinical outcomes vanished if

Table 3. Adjusted Odds Ratio (OR) for Adverse Clinical Outcomes for Pneumonia Patients With or Without Schizophrenia According to Characteristics of the Hospital and Physician in Taiwan

Presence of Adverse Clinical Outcome	Adjusted OR, 95% CI Schizophrenia vs Nonschizophrenia		
	A. Hospital ownership		
	Public	Private	
Intensive care unit admission	1.72* (1.02–2.92)	1.92*** (1.38–2.68)	
Acute respiratory failure	1.22* (1.03–1.92)	1.45* (1.10–2.10)	
Mechanical ventilation	1.23 (0.88–1.72)	1.54* (1.03–2.32)	
In-hospital death	1.07 (0.34–3.37)	1.70 (0.85–3.42)	
	B. Hospital level		
	Medical center	Regional hospital	District hospital
Intensive care unit admission	1.02 (0.57–1.78)	2.10*** (1.40–3.16)	2.08* (1.18–3.67)
Acute respiratory failure	0.89 (0.43–1.87)	1.64* (1.05–2.69)	1.36* (1.07–1.86)
Mechanical ventilation	1.38 (0.73–2.63)	1.69* (1.02–2.86)	2.11* (1.05–4.21)
In-hospital death	1.20 (0.35–4.15)	1.61 (0.60–4.32)	1.48 (0.51–4.32)
	C. Physician age		
	<40	40–49	>49
Intensive care unit admission	1.58* (1.07–2.35)	1.92* (1.24–2.98)	1.44* (1.06–2.12)
Acute respiratory failure	1.27 (0.77–2.09)	1.66* (1.04–2.67)	1.23 (0.45–3.36)
Mechanical ventilation	1.67* (1.01–2.78)	1.84* (1.08–3.16)	1.26 (0.46–3.44)
In-hospital death	1.30 (0.52–3.21)	1.43 (0.53–3.92)	1.19 (0.30–4.74)
	D. Physician specialty		
	Pulmonary or critical care medicine		Others
Intensive care unit admission	2.10*** (1.41–3.12)		1.46* (1.01–2.13)
Acute respiratory failure	1.49* (1.10–2.35)		1.17 (0.75–1.83)
Mechanical ventilation	1.67* (1.05–2.67)		1.37 (0.94–2.60)
In-hospital death	1.91 (0.79–4.62)		1.12 (0.50–2.48)

Note: CI, confidence interval; ICU, intensive care unit. In general, adjusted ORs were calculated by conditional logistic regressions (stratified by patient gender, age, year of admission, length of stay, Charlson Comorbidity Index score, physician, and hospital) to adjust for physician's age, gender and specialty, and hospital accreditation level, ownership and geographic location, and clustering effects of physician and hospital. However, "hospital ownership" was not listed as an adjusting variable in model A, while "hospital accreditation level" was excluded in model B, "physician age" was excluded in model C, and "physician specialty" was excluded in model D. * $P < .05$; ** $P < .01$; *** $P < .001$.

patients were treated in medical centers. This suggests that the differences in outcomes for treatment of pneumonia among patients with and without schizophrenia could ultimately be minimized by quality of medical care. We further found that the risks of adverse outcomes were lower if patients were treated by older physicians (>49 y old). In addition to possibly supporting the "practice makes perfect" hypothesis,²¹ it is also possible that more severe patients were referred to the younger physicians for clinical care. Meanwhile, patients with more severe pneumonia were also more likely to be cared for by pulmonary/critical care physicians, which may account for the inferior clinical outcomes observed among these specialists.

It is crucial to stress that the adverse clinical outcomes observed among patients with schizophrenia were not necessarily the fault of the healthcare providers or system. Due to the limited elements available and the cross-sectional nature of the study, our results are incapable of substantiating the extent to which patient-related vs healthcare-related factors may have contributed to the

differences among patients with and without schizophrenia in treatment outcomes for pneumonia. However, previous literature has proposed several plausible factors explaining the association identified. For patient-related factors, schizophrenia has been linked with several cognitive, affective, and behavioral patterns that can affect health outcomes. Patients may have reduced access to physical healthcare due to cost, social isolation, impaired cognition, deficient communication skills, and altered perception of symptom awareness.^{22–24} Reduced sensation and pain responsiveness might also be involved, as well as poor patient cooperation and compliance.^{25,26} Such patients may therefore be sicker and display later in the course of their disease, leading to more adverse outcomes after the time of diagnosis.²⁰ Several risk factors (eg, cigarette smoking,^{27,28} alcohol abuse,^{29,30} and obesity^{31,32}) implicated in adverse outcomes for respiratory diseases are also more prevalent among these people. Inappropriate lifestyle choices (eg, poorer diets, and less physical activity) also

predispose patients with schizophrenia toward worse physical health problems and illnesses.³³

As for healthcare-related factors, schizophrenia has been associated with deficits in quality of medical care. Previous studies have identified increased risk of adverse outcomes, defined as injuries caused by medical care rather than underlying illness, among patients with schizophrenia. Daumit et al¹¹ observed that patients with schizophrenia experienced higher odds of several events regarded as Patient Safety Indicators and poor clinical outcomes during hospitalization on medical and surgical floors (eg, infections due to medical care and sepsis). When patients with schizophrenia are hospitalized on medical wards, healthcare professionals may be inexperienced at managing their special needs and may use psychotropics inappropriately to control agitation. Oversedation, eg, could lead to potential problems such as aspiration and respiratory failure.^{11,34} In addition, physical diseases are frequently underdiagnosed among patients with schizophrenia.³⁵ Poor treatment outcomes could also reflect physicians' minimization or misinterpretation of patients' somatic complaints as "psychosomatic," delay in recognizing signs or symptoms that require timely attention, or lack of adequate skills to deal with this population.^{11,35} On the other hand, psychiatrists might not be proficient at detecting physical symptoms and performing basic physical examinations for psychiatric patients.³⁶

This study has unique strengths. Using a nationwide population-based data set, the number of cases provides ample statistical power to detect differences between groups after adjusting for confounders. A comparison of treatment outcomes with the general patient population was also possible. Nevertheless, 4 limitations of this study deserve consideration. First, because it used an administrative claims database, clinical diagnoses of schizophrenia or comorbid chronic medical conditions relied on the precision and completeness of ICD-9-CM coding, which is subject to inaccuracy. Based upon this system, risk adjustment for clinical severity was not feasible. Second, our NHIRD may not represent all patients who sought treatment for schizophrenia and pneumonia. Patients with schizophrenia might underutilize physical healthcare and present later in the natural course of the disease.²² Possible differences in prior use of services between groups should be noted, despite the use of the Charlson comorbidity index for adjustment. Furthermore, despite excluding patients with other psychiatric illnesses, by identifying schizophrenia by hospitalization within 2 years prior to the index pneumonia, our study tended to include patients with more severe schizophrenia and more complex conditions. Using this definition, individuals with schizophrenia who had not had a psychiatric hospitalization in the past 2 years would be excluded from both the schizophrenia and comparison groups. It is also possible that some individuals with schizophrenia who were hospitalized for condi-

tions other than schizophrenia or pneumonia may have been included in the comparison group. However, that number should be tolerably low because once a person has been diagnosed with schizophrenia, regardless of the cause of hospitalization, the schizophrenia diagnosis would also be coded because payment for use of medical services is waived for such patients. Third, although excluding patients with substance use disorders or any psychiatric disorder from both the schizophrenia and comparison groups promotes homogeneity and comparability between groups, we might have consequently missed certain information related to pneumonia outcomes and the samples may be less generalizable. Last, the NHIRD lacks important variables such as cigarette smoking and body mass index, which are likely to be associated with treatment outcomes for respiratory diseases.

In addition to the alleviation of psychotic and associated symptoms, it is becoming increasingly clear that physical illnesses of patients with schizophrenia must also be taken seriously. To improve clinical outcomes for patients with schizophrenia who are hospitalized for pneumonia, appropriate integration between mental health and physical health providers should be necessary. Physical healthcare professionals should obtain prompt psychiatric consultation when there is a need to calm agitated patients and facilitate more effective interaction and communication between patients and caregivers. Psychiatrists should also be able to examine and recognize physical diseases in people with schizophrenia and familiarize themselves with the most frequent physical conditions that go underdiagnosed or misdiagnosed among such patients. Careful monitoring and proper integration between psychiatrists and physicians will give these patients a better chance of receiving early and appropriate treatment for pneumonia, which in turn leads to reduced complications and health resource use.

Significant barriers to prompt and appropriate medical care remain for patients with schizophrenia. There is a need for research aimed at optimizing physical health and providing appropriate medical care to improve treatment outcomes for this vulnerable population. Additional research is required to better comprehend the mechanisms that could account for our findings and in order to develop practical strategies to address this problem.

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